

already the Nauplius-stage and to have arrived at the Cypris-stage. The exuviae of the Nauplius-stage still adhered to the covering of the Cypris; still it was not easy to make out which parts had developed from the Nauplius appendages."

The largest species of the genus known has been called *S. darwini*. Only a single specimen of this splendid form was dredged during the *Challenger's* cruise, and of it, through the courtesy of Mr. Murray, we are enabled to give the woodcut illustration on the previous page. This specimen was found as represented attached to a manganese nodule; these nodules, according to Mr. Murray, are formed by concretionary depositions around shark's teeth, pumice, and other substances at the bottom of the sea; it was dredged at Station 299, December 14, 1875, lat. $33^{\circ} 31' S.$, long. $74^{\circ} 43' W.$, at a depth of 2160 fathoms, from a bottom of gray mud. Four large complemental males were found attached between the mantle and the scutum at a short distance from the apex of the valve and close to its occludent margin. Three specimens were on the left and one on the right side.

Of the genus *Verruca*, ten species, of which six are new, were found. They are among some of the most interesting forms of animal life collected during the Expedition, and prove that the number of recent species is much greater than had been to this supposed to exist, and that the genus has a true worldwide distribution. Of the six stations which yielded *Verruca* one belongs to the Northern Atlantic, three to the Southern Atlantic, one to the Pacific, and one to the Malay Archipelago. By these discoveries the range in depth has been immensely increased; the greatest depth known to Darwin for *V. strömia*, O.F.M., was 90 fathoms, but the six new *Challenger* species inhabit depths of from 500 to 1900 fathoms. Of the genus *Balanus* nine species are referred to, and five described as new; and of the genus *Chthamalus* one new species is described. This memoir is accompanied by thirteen plates.

The volume has been edited by Mr. Murray, and is one of the most important to the student of invertebrate forms yet published of these Reports.

GERMAN METEOROLOGY

Repertorium der Deutschen Meteorologie. Leistungen der Deutschen in Schriften, Erfindungen und Beobachtungen auf dem Gebiete der Meteorologie und des Erdmagnetismus von den Ältesten Zeiten bis zum Schlusse des Jahres 1881. Von G. Hellmann. (Leipzig: Verlag von Wilhelm Englemann, 1883.)

IN this goodly octavo volume of 498 pages, presenting an exhaustive catalogue of the meteorological literature of Germany from the earliest to the present time, Dr. Hellmann has done a service to science, the practical value of which it would be difficult to overestimate. The work is divided into three parts. The first part comprises the writings and discoveries, and is in two divisions. The first of these divisions gives the names of authors and the titles of their works; and the fulness and satisfactoriness of detail with which this is gone into may be seen by referring to "Dove," who was the prince of German meteorologists, and "Helmholtz," the latter contributing only one paper—on whirlwinds and thunderstorms—and the former 208 papers, embracing all depart-

ments of the subject. The principal events in the biography of each author are briefly indicated, together with the date of publication of each contribution and the work in which it appeared. The second division is an index of subjects comprised under meteorology, terrestrial magnetism, and atmospheric electricity; and the completeness with which this part of the work is done may be seen by a reference to "Barometer," the various papers relating to which are grouped under thirty heads. The heading "Astro-Meteorologie" shows that even the antiquities of the science have not been overlooked.

The second part gives a catalogue of stations, and is in two divisions—the first comprising stations and the different series of observations made at them; and the second, indexes of subjects and observers. The stations are arranged according to the different States of Germany where they are situated; and sections are set apart for stations the observations at which have been published *in extenso*; at which six or more observations have been made daily; stations for investigating forest meteorology, for weather telegraphy, and for international meteorology; high-level stations at heights of 1969 feet and upwards; and stations at which observations have been made for at least fifty years. To these is appended an index of observers' names and their stations.

The third part is historical, presenting an outline of the history of meteorological observations in Germany; a valuable chronological table from the eighth century downwards, detailing the more important facts in the history of meteorology and terrestrial magnetism; and the book closes with interesting statistics showing for the decennial periods beginning with 1480 the progress and extension of meteorological observations over Germany. A map is added showing the meteorological stations in the German Empire at the present time; and on the same sheet a small map showing the stations in Germany in 1781, including those established in connection with the Societas Meteorologica Palatina.

The extreme importance of this undertaking to all workers in meteorology, terrestrial magnetism, and atmospheric electricity, and the ability with which Dr. Hellmann has carried it through, make us regret with a strong feeling of shame the financial difficulty that was allowed to stand in the way of completing a similar catalogue of the meteorological literature of all nations. From Dr. Hellmann's letter to the International Meteorological Committee at Berne, dated July 20, 1880, it appears that all that was required to complete this great work was the raising of a sum not exceeding 1200*l.* As however there appeared to be no hope of this small sum being raised or even guaranteed, Dr. Hellmann, in a spirit and with an energy which cannot but call forth the warmest approbation of scientific men, set to work in the autumn of that year, and was in a position in May 1883 to sign the preface of the work now before us. No small praise is also due to Herr Englemann, for the effective help he has given in its publication.

For want of such catalogues, the workers, not merely in meteorology, but in every department of science, are crippled, and the remark applies with peculiar emphasis in the case of those who are entering on the work of scientific research. Indeed, the waste of time and brain-work in carrying on scientific work no longer necessary

because it has been already done is so great, and the consequent material loss to the nation so serious, that the time cannot be far distant when the Governments of this and other countries will have no choice, but yield to the demands made for a moderate annual grant towards defraying the expenses incurred in preparing and publishing these indispensable aids to all workers in science.

OUR BOOK SHELF

Berly's Electrical Directory. Third Edition. (London and New York, 1884.)

THIS work consists of three separate directories, separately paged, but bound up together; the first, of 228 pages, relates to British trades and professions connected with electricity; the second, of 273 pages, is devoted to similar matters from America; whilst the third is Continental. Of the last, 71 pages are French and Belgian, 12 German, and 3 relate to other countries, chiefly Russia. This arrangement, though convenient probably to the compilers, strikes us as being bad for many purposes. The American and French sections are particularly full of information. The British section opens with remarks on the progress made in electrical business during the past year, after which come various tables and formulæ. These are by no means satisfactory. In the formulæ for dimensions of units, many of the numbers which should have been printed as powers are given as simple multipliers. Though the table begins with C.G.S. units, and professes to describe those accepted by the British Association and the International Congress of 1881, the ohm is given as equal to 10^7 absolute units and the volt as 10^8 , whereas the figures should respectively be 10^9 and 10^8 . All this is very misleading. So also is the following statement:—"Calling gravitation the natural unit of force, the absolute unit of force will be $\frac{1}{9 \cdot 81}$ th part of it." This statement ushers in the following definition:—"Unit of Mechanical Effect is the unit of force carried up through one centimetre, or $\frac{1}{9 \cdot 81}$ raised one centimetre."

Is it possible that this chapter on formulæ has been translated literally from the pages of some French writer who was in the habit of using a mixed metre-gramme-second system instead of either the centimetre-gramme-second or the metre-kilogramme-second system? With the exception of the scientific part, the editing appears to have been carefully and soundly done, and the commercial information is very extensive.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

"The Unity of Nature"

IT was, I think, in the course of last year, or of the year preceding, that I ventured to remonstrate against the use sometimes made of your columns by Mr. G. J. Romanes for the purpose of inculcating his personal beliefs, and disbeliefs, on subjects which lie outside the boundaries of physical science.

The observations made by him in your paper of March 20 upon the book I have lately published ("Unity of Nature") show that in that remonstrance I committed an offence which Mr. Romanes has not forgotten or forgiven. Nevertheless I must repeat it; and this time I have the advantage of his own confession, that "the pages of a scientific journal are not suited

to an examination" of those parts of my book which he has nevertheless denounced in your pages with unusual violence of language. If your pages are not suited to such an examination, neither can they be suited to comments which nothing but that examination could justify. The tone of these comments is a very clear proof of the necessity of our all keeping within the marches when we meet on neutral ground. Scientific facts and scientific hypotheses constitute that neutral ground. On the other hand, the bearing of these facts and of these hypotheses on questions of philosophy and of religion constitutes a separate region in which, if we meet at all, it must be outside the pages of a purely scientific journal. In that separate region it has always been my endeavour to argue without personal passion and without contumely towards opponents. I should be ashamed in any argument to display the animus which has in this case dictated the language of Mr. Romanes on subjects which, by his own confession, he has no right to drag into your pages. He may hold that the highest aim of the human intellect is to prove the mindlessness of nature. My book deals, and was intended to deal, with this philosophy; and I did not expect Mr. Romanes to like it. How much he dislikes it is remarkable. But he will find no passage in it which descends to the level of some of his comments.

Having dismissed, as irrelevant in your columns, the criticisms of Mr. Romanes on the "Unity of Nature" which have no connection with science, I now turn to some of those which have this connection, and are at least perfectly legitimate in their character.

Mr. Romanes is quite right when he says that I object to the "*newer philosophy*" which makes experience the source of instinct. In my view this theory is, in the strictest meaning of the word, nonsense, because experience is obviously a "synthesis of intuitions," and not the source of them. It is a plain fact that instinctive movements and instinctive sensations are the conditions precedent—the sole materials—of experience. Experience is nothing but the memory in living creatures of their own previous action on external things, and of the reaction of external things upon themselves. It is the combined consciousness of both which builds up what we call experience. But in every step of this process, whether of action, or of reaction, or of the combined memory of each, not one instinct only, but several instincts are concerned. Experience therefore is the result of instinct, and not the converse.

With this argument Mr. Romanes does not even attempt to deal.

He does, however, attempt to deal with my contention that instinct is always strictly correlated with organic structure, and that special instincts are always connected with "organs already fitted for and appropriate to the purpose." He says that my own case of the dipper ought to have taught me better; "for," he adds, "the dipper belongs to a non-aquatic family of birds, and therefore has no organs specially adapted to its aquatic instincts."

This argument, as an argument, is a *non sequitur*; and as a statement of fact is altogether erroneous. It is quite true that the dipper has not webbed feet. But it is not true that webbed feet are at all necessary for aquatic habits of a particular kind; nor is it true that the dipper is wanting in other peculiarities of structure which are most specially adapted to its peculiar aquatic habits and instincts. There are many birds which swim excellently well without webbed feet, as, for example, all the Gallinules, and some of the Tringidæ. The dipper does not need webbed feet, because it neither swims nor dives in deep water; and because on the other hand it positively needs feet free from web for grasping stones under rapid streams, as well as for grasping rock-surfaces in the places of its nidification. On the other hand, the structure of its wings, and above all the structure and texture of its feathers, are all specially modified and adapted to its aquatic habits.

It is for Mr. Romanes to prove, if he can, that the dipper once had an ancestor which began to dive in water, whilst as yet its wings had not a shape and a texture adapted to the purpose, and whilst its plumage was still pervious to water, and so was liable to be drenched and sodden.

Mr. Romanes protests against my suggestion that rudimentary organs may, sometimes at least, be the beginnings of a structure destined for future use, and not the relics of a structure whose use has been in the past. Yet in the same paper he himself suggests that the dipper may be on the way to having webbed feet, and only wants them now because it has "not yet had time to de-